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## PLANT AND PRODUCT TREATMENT

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This invention relates to a plant and product treatment and in particular to a treatment which acts as an anti-mildew and anti-fungal spray which also has anti-bacterial properties. The invention also provides, in association with such treatment a synergistic treatment which encourages growth of plants.

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Historically, plants and crops (hereinafter generally referred to as plants) have been treated by the use of traditional agri-chemicals many, of which have been found to have undesirable side-effects. As a result, there has been pressure, mainly from consumers, for a move towards safer and more "natural based" alternatives. This can be attributed to;

A growing global trend towards the reduction of chemical and pesticide use

A push for more "Organic Produce"

Growing public concern's over what goes into our food

The introduction of tougher legislation either banning or severely restricting the use of many existing chemicals

Growing public awareness to the effects of prolonged exposure or use of chemicals

In Europe, for example, Government's are providing incentives to growers who adopt more desirable practices. This new approach, which is established on a country by country basis, is essentially a move as close as possible towards total organic production.

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It is known to use, as an anti-bacterial agent, products produced from citrus, specifically oranges, such as a product called Cytosan (Trade Mark but there are other broadly similar products such as Citrex (Trade Mark)) and which can be considered to be a mixture of bioflavanoids or products made from different citrus fruit such as grapefruit. For convenience, we shall refer to these types of products as citrus agents.

Citrus agents are conventionally made from the residue of juice manufacture, skin, pulp and pips, and this residue is dried and then ground into a powder. If required, the product can be treated to remove the soluble material, largely the bioflavanoids, therefrom leaving the fibre as waste. The treatment to remove the soluble material may be by the use of glycerine in which the bioflavanoids are soluble.

Caprylic acid (which is also known as octanoic acid) is known as an anti-fungal agent.

Both the citrus agents and caprylic acid are quite expensive.

The object of the invention is to provide a new plant and product treatment which has anti-bacterial and anti-fungal actions which have not been achieved by either citrus agents or caprylic acid, and which can also preferably have anti-mildew and anti-viral properties.

We have found that the provision of a mixture of citrus agent and caprylic acid together with carriers, possibly alcohol, surfactant and water, provides a synergistic mixture which gives a better result than the use of either of the compounds alone when used to treat plant materials and plant products.

We have also found that when such a mixture is combined with a micro-nutrient (the use of which is known to assist in plant growth), the growth of plants is substantially enhanced over what would have been expected from each of the treatments alone.

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In a first aspect, the invention thus includes a synergistic mixture for the treatment of plant and plant products which includes both a citrus agent and caprylic acid.

We have found by using a mixture of the invention we can reduce considerably the quantity of citrus agent needed to give a required end result and use only a small quantity of caprylic acid, which is also expensive, to provide a treatment which is very much cheaper than previously available using these compounds separately to provide the results required.

In a second aspect of the invention, we add to the mixture as described above, a micro-nutrient.

The micro-nutrient may come from the class of materials known as NPK's, substances which are a mixture of nitrogen, phosphorus and potassium together with trace elements.

The invention also includes a method of treating plants against bacteria and fungus by spraying these at least once during the growing season with the mixture of a citrus agent and caprylic acid.

Also included in the invention is such a method wherein a micro-nutrient is added to or sprayed with the mixture.

In order that the invention may be more readily understood we shall describe particular embodiments of the invention.

In the first embodiment we use a mixture formed as follows:-

citrus agent	30-60%
caprylic acid	10-30%
alcohol	10-30%
surfactant	5-15%

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In a specific mixture which we have used and from which we have had very good results, we use:

	Cytrosan (a specific citrus agent)	44%
5	caprylic acid	22%
	alcohol	22%
	surfactant	11%

This product we refer to as Croplife.

10 The mixture for use is diluted and we have found that when it is required for use against Downey and Powdery mildew the dilution can be very high. We have found that between 0.25 and 1.5 ml per litre of the mixture added to make up 100 litres provides a satisfactory dilution and 500 litres of this mixture provides good coverage for one hectare.

15 For golf course fungi we have found a dose rate of one litre of the mixture in 100 litres of water, 10ml/litre, is satisfactory.

For fungi found during mushroom production we use a mixture of 3-4 ml per litre of water.

We have effected field trials in mushrooms, grapes, grasses, apples pears mangos potatoes and tomatoes, all with effective results.

20 We have found that we have had positive results against three specific fungi, *Verticillium fungicola* var. *fungicola* (dry bulb), *Mycogone perniciosa* (wet bulb) and *Cladobotryum dendroides*, formally "*Dactylium dendroides*" (Cobweb), which have developed a mutagenic resistance to conventional fungicides.

The synergistic mixture of the invention satisfactorily killed these fungi.

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In the vineyards we used the product against the fungus *Botrytus* (*Botrytis cinerea*) and the mildews, Downey Mildew (*Plasmopara viticola*) and Powdery mildew (*Uncinulanecator*) and the product has been successful against these.

5 The product has been used in grasses and has successfully been used against the following fungi:

*Fusarium acuminaturn*

Brown Spot (*Rhizoctonia*)

Dollar Spot (*Sclerotinia homoeocarpa*)

Fairy Ring (*Agraricales & Gastromycetale*).

10 Tests against bacteria have also provided satisfactory results and amongst bacterias tested are:

*Pseudomonas*

*Erwinia*

*Anthravnose*

15 These tests have also shown that the product appears to be a systemic, that is that a certain percentage of the product will be taken up by the plant through both the leaves and roots and its effectiveness will be retained for some time.

20 Not only have we tried the product on the plants and fruit whilst being grown, we also found that the product can also be valuable post-harvest by dipping or spraying the product into a diluted mixture of the product and this has assisted the life of the harvested products. Where the product has been treated in the field before being treated post-harvest, the results have been enhanced.

25 Practically, we prefer that the product be applied to plants during the cool of the day, and preferably not prior to or just subsequent to rain. As the product is taken up by the leaves, it is better, if it is likely to rain within six hours to apply the product at a later time.

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Also, we have found that to obtain best results, the product can be sprayed in a light mist and the spray be repeated some five days after the first spray.

If, after a second spray, there is still signs of the infestation, the spraying can be repeated after a further five days.

5 We have found that the residues of the product components are not toxic, they are applied in only small quantities, both the citrus agent and the caprylic acid are natural products which are acceptable for use in food and, in any case, because of the low concentrations, the amount of residues is extremely small.

10 Whilst in the specification we have described particular certain applications and percentages of components and quantities applied, it is to be understood that these are exemplary of the invention and not restrictive.

The invention provides a treatment which is cheaper than using high percentage citrus agent as, because of the synergistic effect of the citrus agent and the caprylic acid, the quantity of citrus agent used is greatly reduced and whilst caprylic acid is itself quite  
15 expensive, it is used in such small quantities that the overall cost is minimised. There can be changes in the specific citric agent, the alcohol and the surfactant and where such changes are made, the proportions may have to be varied based on empirical information.

In the second aspect of the invention, we use the product described above together  
20 with a micro-nutrient (or nutritional solution).

These micro-nutrients themselves are known and one particular form "Growers" is an NPK product which includes nitrogen, phosphorus and potassium in a 10:20:10 ratio, together with a large number of trace elements. Growers and similar products are known as nutritional solutions. Whilst in the specific examples, we will refer to the

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use of Growers, it is to be understood that this is an exemplification of a class of known products.

The ratio of the two components can be varied depending on the particular application but, generally we suggest between 5 to 20 ml of Croplife to 1 litre of Growers but these proportions are not limiting.

Some qualitative results of the use of the mixture are as follows:

#### Apples and Pears - DONNYBROOK

Treated 1 hectare of Packham Pears and 1 Hectare of Royal Gala Apples with three treatments of Croplife and two treatments Growers Spray. Pears from the crop were stored in CA for 6 months with conventional DPA treatment. Product had very little rot and mould.

#### Potatoes - Ohio USA

Application rate 4 litres Growers/60ml Croplife per acre applied 6 times during season. Resulted in:

Better Sustained Growth.

No disease outbreaks.

Much improved yield.

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**Tomatoes**

This grower was able to compare the trial plot which comprised 4 acres against a traditionally treated plot and neighbouring plots.

Application Rate 4 litres Growers + 90ml Croplife per acre applied 4 times in season. Resulted in;

Reduction in traditional fungicides and fumigants.

Reduction in fertiliser used.

Reduction in disease (fungi).

Better product size.

Grower said advantage in using Croplife/Growers amounted to saving of USD550/acre over traditional farming with crop as good if not better.

Surrounding blocks under disease pressure.

**Tomatoes - Greenhouse**

Application rate of 2 tablespoons Growers + ¼ oz (7.5 mls) Croplife per 4 litres of water applied weekly. Resulted in;

Significant reduction in incidence of disease.

Better sized and greater volume of produce.



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**Capsicum**

Application rate of 4 litres Growers + 90ml Croplife/Acre applied four times per season.

Significant reduction in incidence of disease.

5 Better sustained crop.

Better yield.

**Ornamentals - Mum's**

10 Application rate of 2 Tablespoons Growers + ¼ oz (7.5mls) Croplife per 4 litres of water weekly.

Plants were essentially disease free.

Much better visible sustained growth.

Superior plant.

15 **Soybean**

Application rate of 6 litres Growers + 60ml Croplife/Acre every 2 weeks after plants were over 6" tall.

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Plants were shooting more suckers.

Generally healthier.

Crop loaded.

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### Grapes

Application rate of 4 Litres Growers + 60ml Croplife/Acre applied 4 times during season. Resulted in:

Significant disease reduction.

Healthier looking plant and product.

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Expect yield increase will follow.

### Wheat

Application rate of 12 litres Growers + 60ml Croplife per acre 3 times during season. Resulted in;

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Dramatic yield increase of 13.5 Bushells/acre.

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**Strawberries**

Used as a transplant solution of 60mls Growers + 30ml Croplife per gallon with much improved transplant rate and noticeably more vigorous growth.

It can be seen from these results that, generally, not only were the plants healthier than would otherwise be the case but, also, all forms of infestation, bacterial and fungal appear to be controlled better than by the use of any of the components separately and the final plant was better and stronger than would have been expected to be the case using more conventional agri-chemicals.